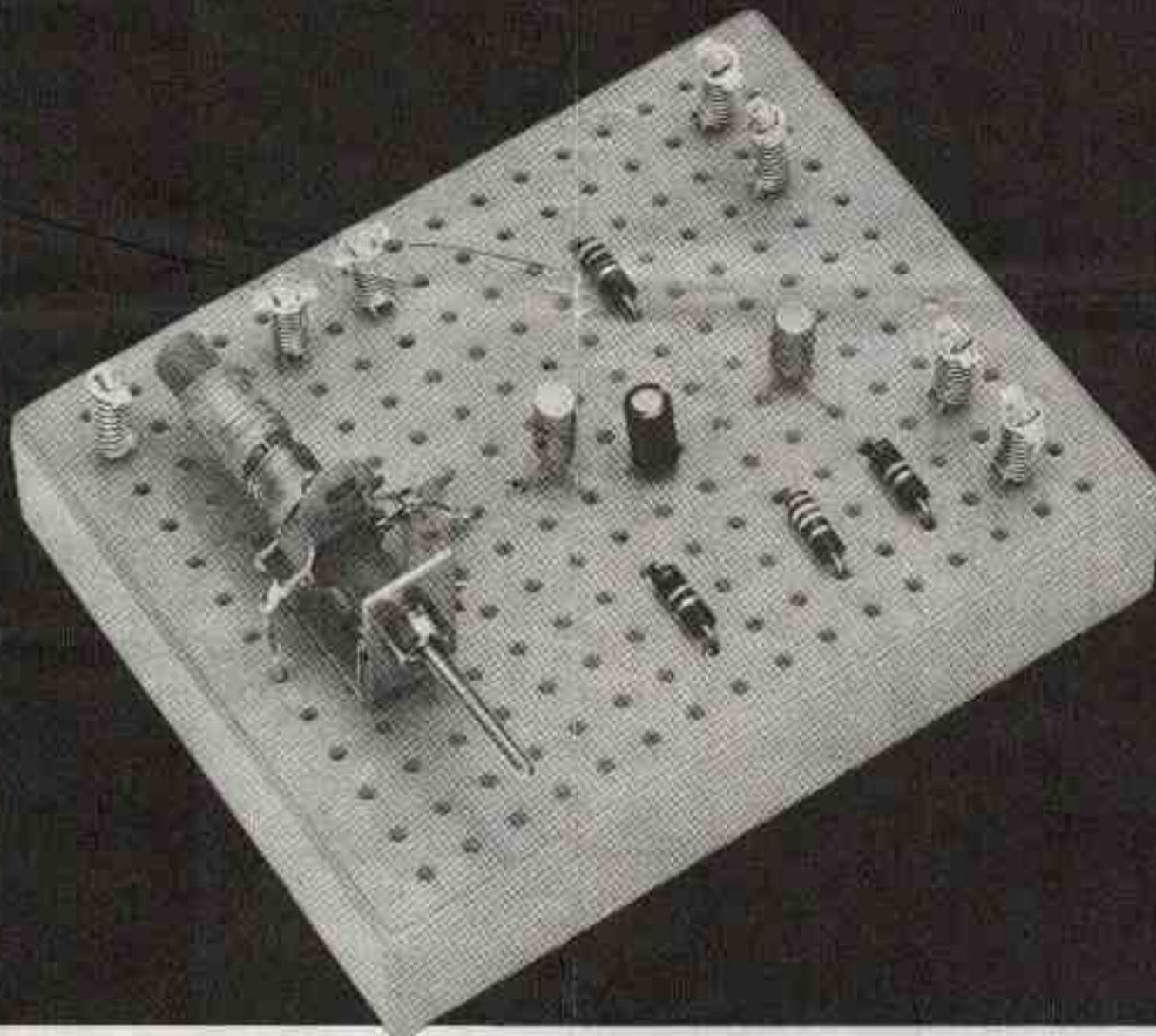


# Science Fair<sup>TM</sup>

INSTRUCTION MANUAL PRICE: 50¢

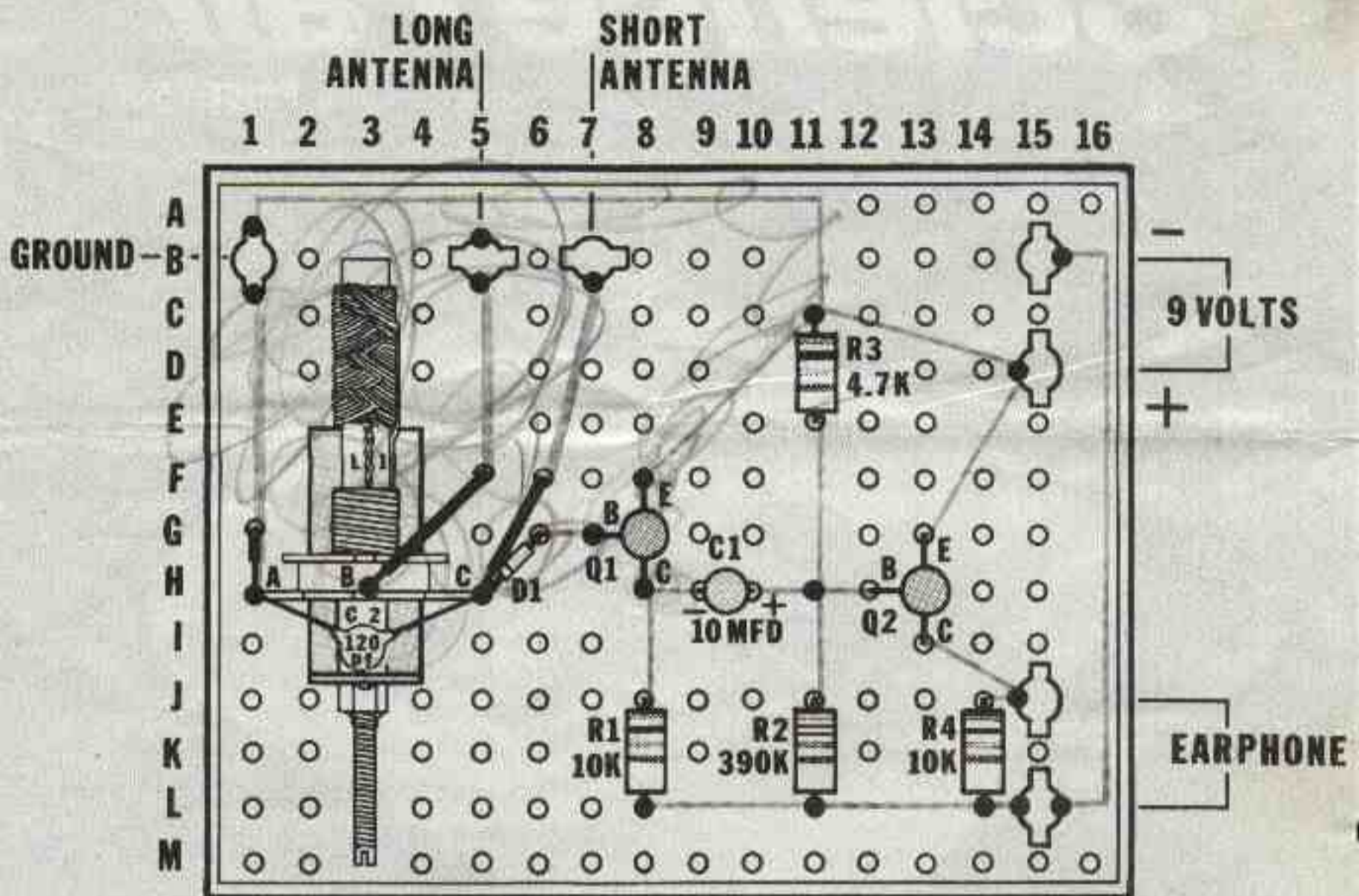


## ELECTRONIC PROJECT KIT # 28-102 TWO TRANSISTOR RADIO

This kit combines the excitement of working in electronics with the pleasure of a radio which you will treasure. Its two transistor circuit provides enough power to pull the major stations in your area with clarity and selectivity. By combining this unit with an amplifier you can have a complete radio with speaker.

The circuit is a basic detector-amplifier. The proper frequency is selected by the antenna coil and capacitor C2. The audio signal is removed from the radio signal by the diode detector D1. The audio signal is amplified by transistor Q1 and again by transistor Q2. The signal is then loud enough to be heard clearly through the earphone.

# FIG. 1 - PICTORIAL DIAGRAM TOP VIEW



## PARTS LIST

Quantity	Description	Identification	Part Number	Price
2	10K Resistor	R1, R4	99-1-002	.15
1	390 K resistor	R2	99-1-004	.15
1	4.7 K resistor	R3	99-1-012	.15
1	120 pfd disc capacitor	C2	99-2-002	.20
1	10 mfd capacitor	C1	99-2-013	.50
1	Antenna loop	L1	99-3-001	1.00
2	PNP Transistor	Q1, Q2	99-4-101	1.00
1	Diode	D1	99-4-602	.25
1	Earphone		99-5-002	1.00
1	Battery clip		99-7-003	.10
3 ft.	Wire		99-7-005	
7	"Push-in" terminal		99-7-006 (Set of 7)	.70
2	nuts		99-8-001	
2	screws		99-8-003	

Science Fair kits are supplied with first quality parts engineered into "trouble free" circuits. However, if replacement parts are required, they can be obtained directly from the factory. When ordering parts be sure to include the Science Fair stock number and payment according to the above price schedule with your order. Minimum parts order \$1.00. Send orders to: Parts Dept., Science Fair Electronics, 2615 W. Seventh St., Ft. Worth, Texas 76107.

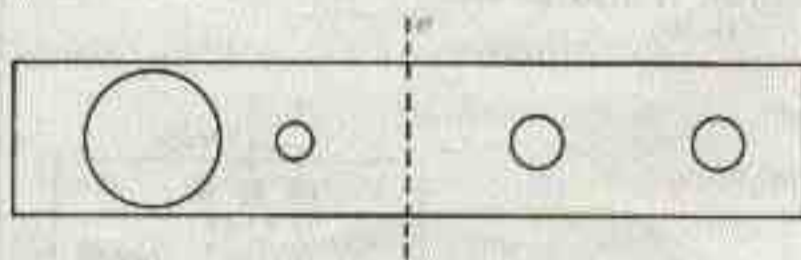
## STEP-BY-STEP WIRING AND ASSEMBLY DIRECTIONS

Be sure to carefully follow all the directions. Do one step at a time and then check off the step in the box provided. Before beginning, read over the enclosed page labeled "Construction Hints."

The step by step instructions indicate a soldering requirement; however, these connections can be made by firmly twisting joining wires together. If the connection is secure the circuit will work for temporary or testing purposes. If you wish a more permanent circuit, it is always best to secure these connections by soldering. Before soldering, read the instructions in "Construction Hints."

1. (X) Check the parts list to see that everything listed is included. Check each step as you progress (✓).
2. (X) Place the pictorial diagram near the perfboard chassis so that the pictorial can be used as a guide for exact placement of parts. The perforations (holes) on the board are numbered and lettered as in Fig. 1. The numbered perforations run from left to right while the letters run from top to bottom. Any point on the board may be identified by this combination of numbers and letters. For example, resistor R1 uses points J 8 and L 8. The gray lines in the pictorial diagram indicate components and wires which are mounted under the circuit board. The solid lines indicate components and wires mounted on top of the circuit board.
3. (X) Mount the 7 "push-in" terminals in holes B1, B5, B7, B15, D15, J15, and L15.
4. (X) A mounting bracket is included for the antenna coil. Place the bracket on the edge of a table and bend to form an "L" shape.

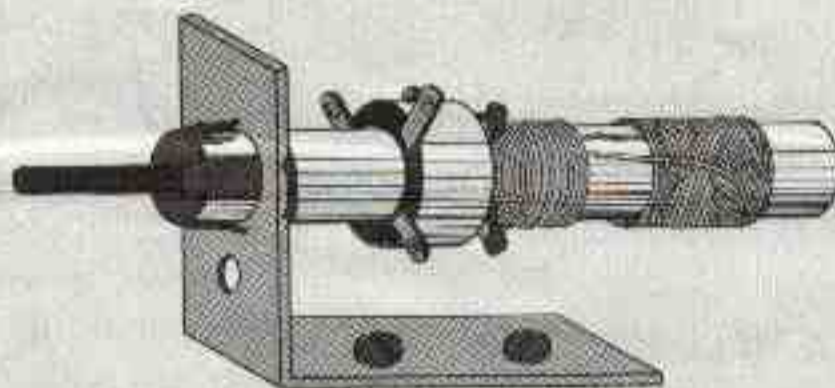
### ANTENNA BRACKET



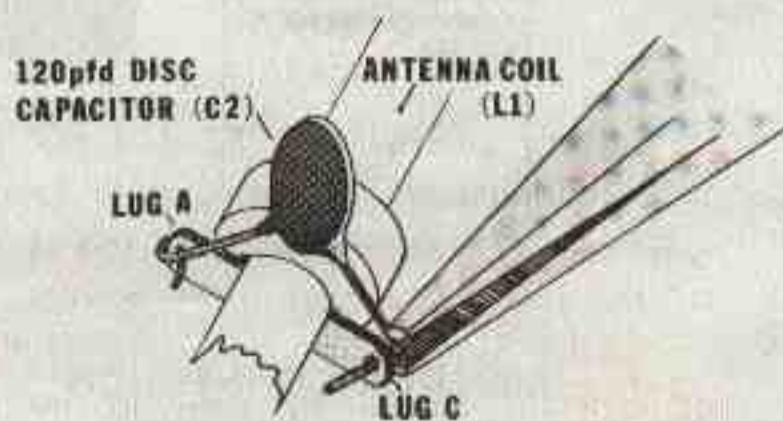
BEND HERE

Slightly enlarge hole F3 and H3 with a soldering iron, reamer, or drill to accommodate (2) two 4-40 X 3/8" screws. Mount the antenna bracket in the position shown in the pictorial diagram. Mount the antenna coil L1 by carefully pushing it through the large hole until it clicks into place.

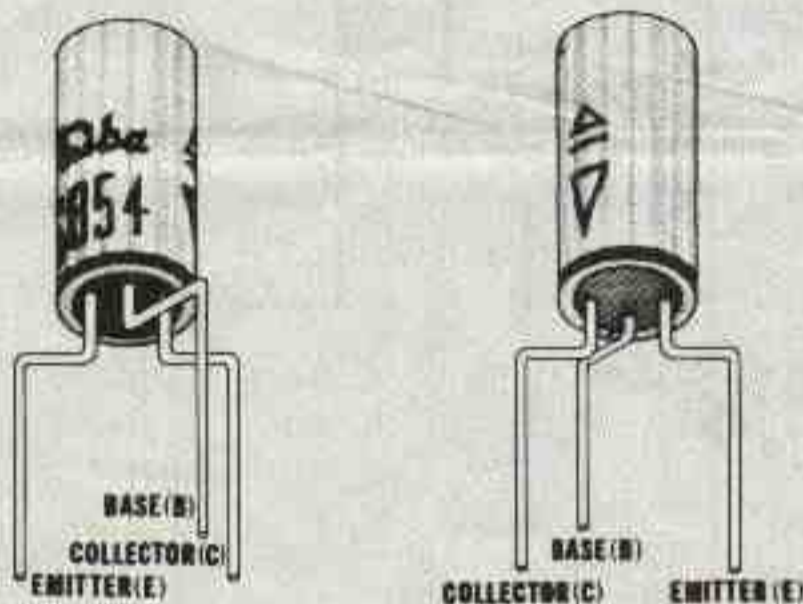
### ANTENNA COIL MOUNTED



5. (X) Remove 1/4" of insulation from both ends of a 3" piece of wire. Connect one end to antenna terminal A. Connect the other end through hole G1 to "push-in" terminal B1.
6. (X) Remove 1/4" of insulation from both ends of a 3-1/2" piece of wire. Connect one end to antenna coil B and solder. Connect the other end through hole F5 to "push-in" terminal B5 and solder.
7. (X) Remove 1/4" of insulation from both ends of a 2-1/2" piece of wire. Connect one end to antenna coil terminal C. Connect the other end through hole F6 to "push-in" terminal B7 and solder.
8. (X) Cut the leads on 120 pf disc capacitor C2 to 3/4". Connect one end to antenna coil terminal A and solder. Connect the other end to antenna coil terminal C. See "Construction Hints" Fig. 4.



9. (X) Mount transistor Q1 as shown in the pictorial diagram Fig. 1. Compare the transistor with Fig. 9 in "Construction Hints." Note that the pictorial diagram is a top view and that a reversal of leads takes place when you turn the transistor over to mount it on the board. Insert the base (B) lead into hole G7. Insert the emitter (E) lead into hole F8 and insert the collector (C) lead into hole H8.



10. (X) Connect the banded end of a diode D1 to antenna coil terminal C and solder. See "Construction Hints" Fig. 13. Connect the other end through hole G6 to the base lead of transistor Q1 at G7 and solder.



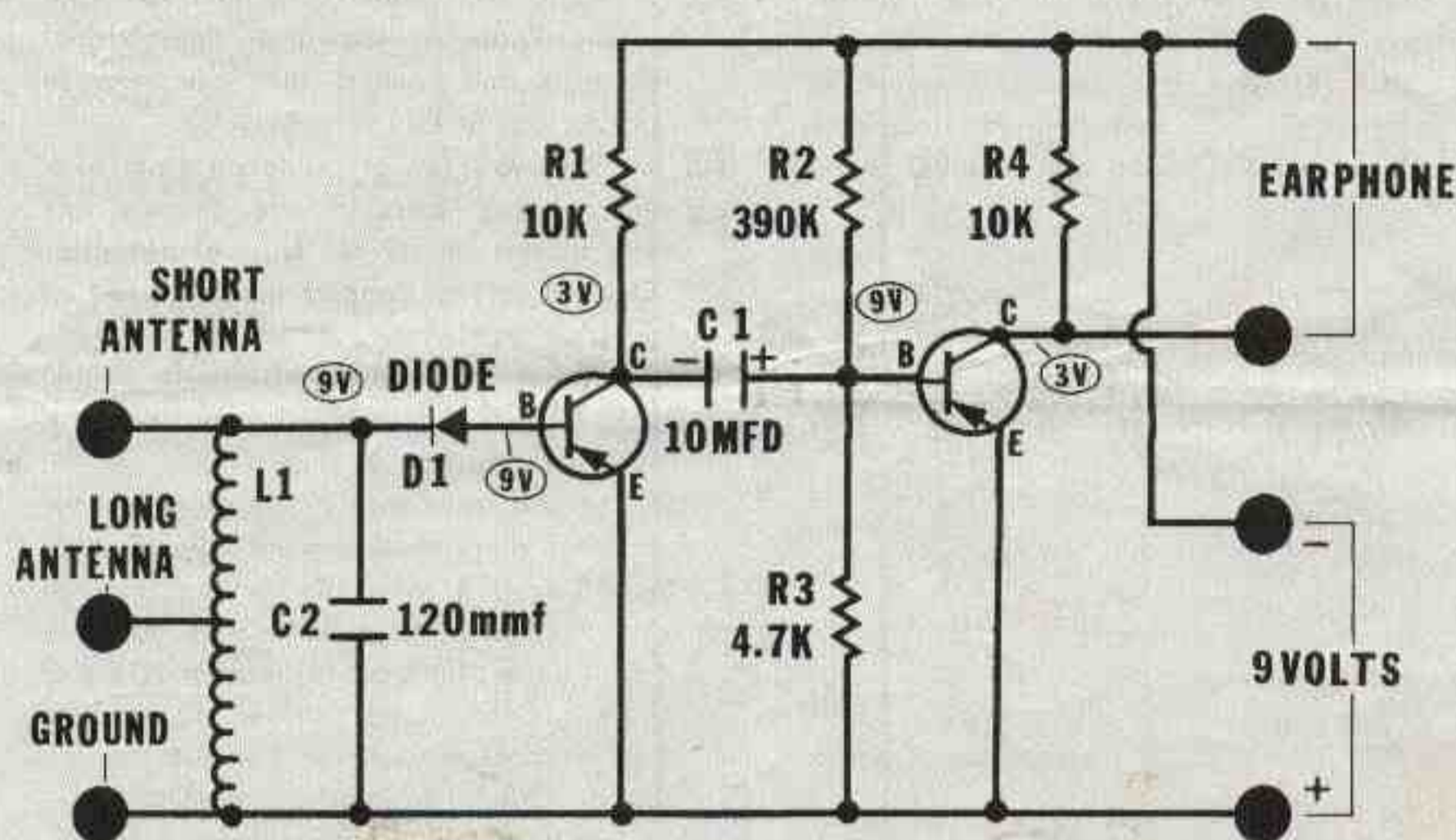
11. (X) Mount 10K resistor R1 (brown, black, orange) from L8 to J8. Connect one end to the collector (C) lead of transistor Q1 at H8.
12. (X) Mount 10MFD electrolytic capacitor C1 inserting the plus (+) lead into hole H10 and the minus (-) lead into hole H9. See "Construction Hints" Fig. 3. Connect the minus (-) lead to the collector (C) of transistor Q1 at H8 and solder.

13. (X) Mount a 4.7K resistor R3 (yellow, violet, red) from C11 to E11. Connect one end to the plus (+) lead of capacitor C1 at H11.
14. ( ) Remove 1/4" of insulation from both ends of a 4-1/2" piece of wire. Connect one end to "push-in" terminal B1 and solder. Route as shown in the pictorial diagram and connect the other end to resistor R3 at C11.
15. ( ) Remove 1/4" of insulation from both ends of a 2" piece of wire. Connect one end to the emitter (E) lead of transistor Q1 and solder. Connect the other end at C11.
16. ( ) Mount 390K resistor R2 (orange, white, yellow) from L11 to J11. Connect one end to the connection at H11.
17. ( ) Mount transistor Q2 as shown in the pictorial diagram. Insert the base (B) lead into hole H12. Insert the emitter (E) lead into G13 and the collector (C) lead into I13. Connect the base (B) lead at H11 and solder. Connect the emitter (E) lead to "push-in" terminal D15. Connect the collector (C) lead to "push-in" terminal J15.
18. ( ) Remove all insulation from a 1-1/2" piece of wire. Connect one end at C11 and solder. Connect the other end to "push-in" terminal D15 and solder.
19. ( ) Mount a 10K resistor R4 (brown, black, orange) from L14 to J14. Connect one end to "push-in" terminal J15 and solder.
20. ( ) Remove all insulation from a 3" piece of wire. Connect at L8, L11, L14, and L15. Solder all connections.
21. ( ) Remove 1/4" of insulation from both ends of a 3-1/2" piece of wire. Connect one end to "push-in" terminal B15 and solder. Connect the other end to "push-in" terminal L15 and solder.

NOTE: Clip all extra wires at the soldered points.

You have completed all connections, both wiring and soldering. Carefully double check the work against the pictorial diagram.

**FIG. 2 SCHEMATIC TWO TRANSISTOR RADIO**



All voltage measurements made from the minus (-) terminal B15 with the Science Fair VOM Multi-tester #28-122.

## OPERATION

This radio will work at top efficiency only if you have a good antenna and ground connection. You may use a cold water pipe for ground, however, a metal rod driven 2 to 4 feet into the ground works best. The antenna terminal should be connected to an outdoor antenna of the type illustrated in Fig. 3 (Radio Shack Cat. #278-1373) and can be as long as facilities permit. If this is impractical you can wrap a five or six foot piece of wire around a lamp cord and connect one end to the radio. Make sure the lamp is plugged in and turned on. It is also possible to connect it to the metal dial stop on your telephone. NOTE: For longer

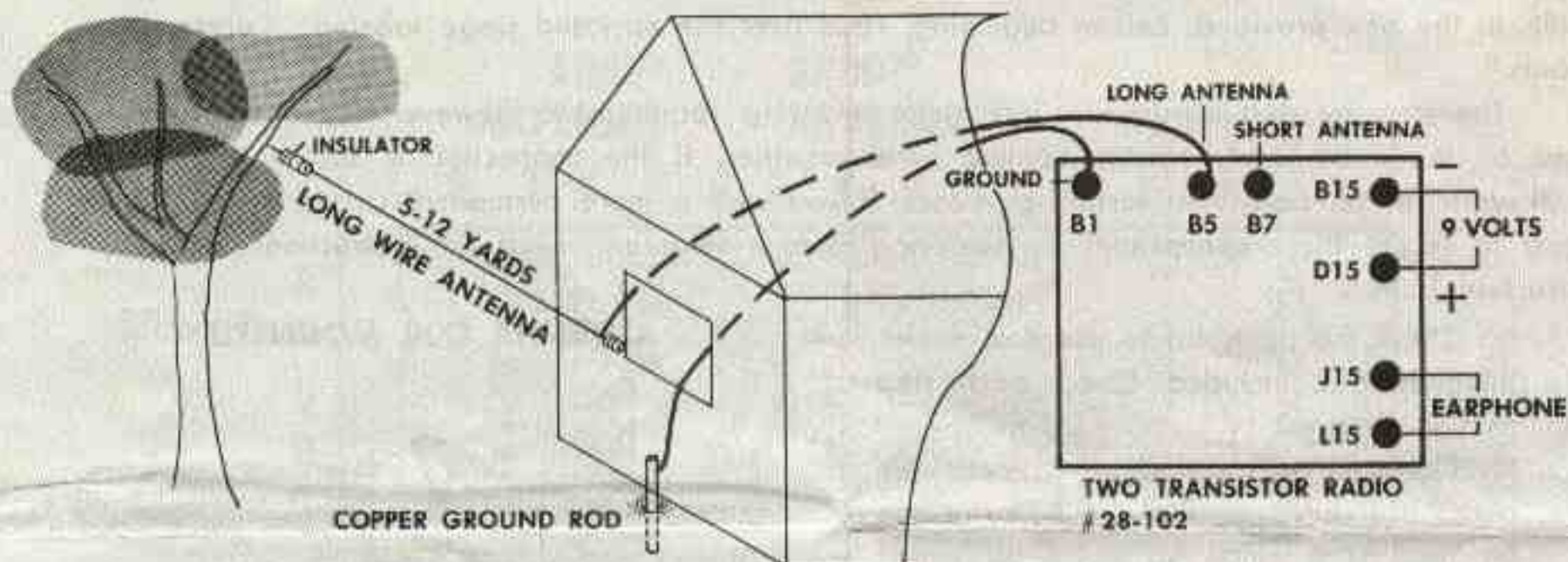
antennas use antenna "push-in" terminal B5 and for shorter antennas use "push-in" terminal B7.

Connect the red lead of the battery clip to "push-in" terminal D15. Connect the black lead to "push-in" terminal B15. Connect the earphone inserting one lead into each of the "push-in" terminals J15 and L15. Insert 9 volt transistor radio battery (Radio Shack Cat. #23-464 or 23-152).

You can tune your radio by turning the slug (the metal screw sticking out of the antenna coil) in the antenna coil. Be careful not to break the antenna by twisting too hard when the slug has been turned as far as it will go.

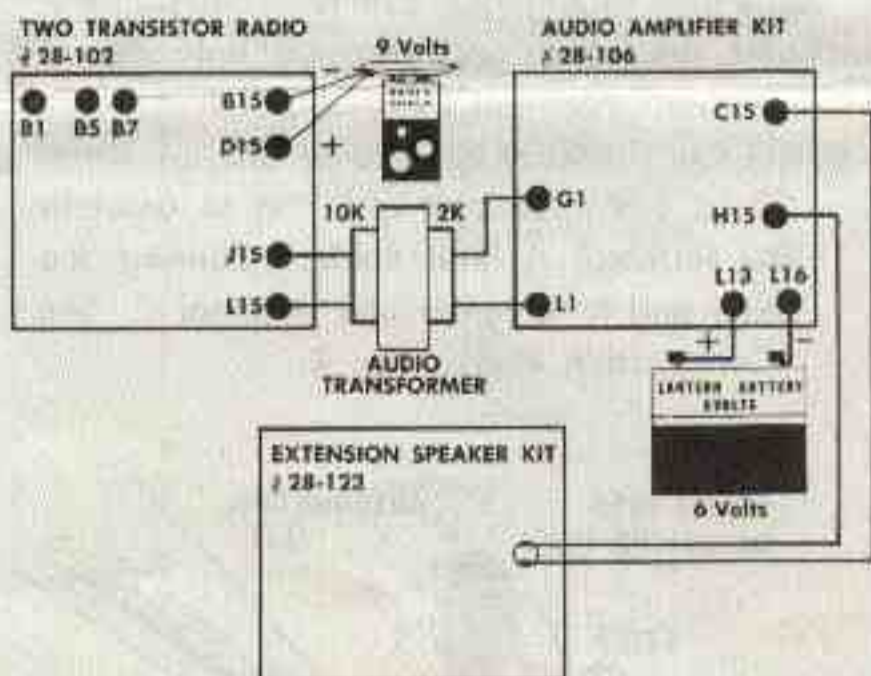
**FIG. 3**

**TYPICAL INSTALLATION**



**AMPLIFIER CONNECTION**

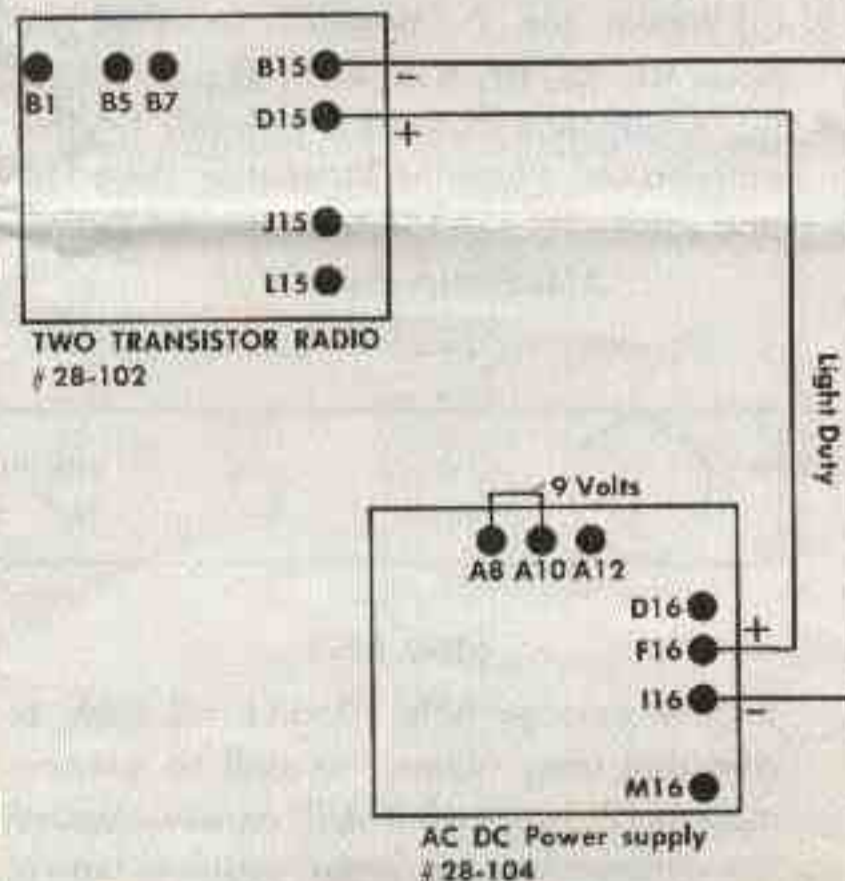
To make your radio complete with speaker it is necessary to add additional amplification. Ideal for this purpose is the Science Fair OTL Amplifier #28-106 and the Science Fair Extension Speaker #28-123. It is necessary to couple the radio to the amplifier with a dropping transformer #273-1378. Complete connections are shown below.



**AMPLIFIER CONNECTION**

**POWER SUPPLY**

For more permanent use you can completely eliminate the need for batteries with the AC-DC Power Supply Kit #28-104. It supplies either 6 or 9 volts DC for use with most of the Science Fair Kits as well as most transistor radios, tape recorders, and phonographs. Complete connections are shown below.



**POWER SUPPLY CONNECTION**